CLAIM AMENDMENTS

Please cancel claims 1-20, 42-43, 53-54 and 88-118, and amend claims 25-26, 32, 34, 40, 45, and 51, all without prejudice, as indicated on the following listing of all the claims in the present application after this Amendment.

1-20 (Cancelled)

21. (Original) A method for detecting misalignment of overlying or interlaced periodic structures, comprising:
illuminating the overlying or interlaced periodic structures with incident radiation;
detecting diffracted radiation from the illuminated portions of the overlying or interlaced periodic structures to provide an output signal; and
determining a misalignment between the structures from the output signal.

22. (Original) The method of claim 21, wherein said determining includes comparing the output signal with a reference signal.

23. (Original) The method of claim 22, wherein the reference signal comprises a database.

24. (Original) The method of claim 21, wherein the output signal contains information related to ellipsometric parameters.

25. (Currently amended) The method of claim 21, wherein <u>said</u> overlying or interlaced periodic structures ~~has~~<u>comprise</u> at least two interlaced grating lines having different periods, line widths or duty cycles; the incident radiation is incident on the structures at an oblique angle; and the diffracted radiation comprises zero-order diffraction.

26. (Currently amended) The method of claim 21, wherein <u>said</u> overlying or interlaced periodic structures ~~has~~<u>comprise</u> at least two interlaced grating lines having

different periods, line widths or duty cycles; the incident radiation is incident on the structures at a normal angle; and the diffracted radiation comprises zero-order diffraction.

27. (Original) The method of claim 21, wherein the incident radiation is substantially normal, and the diffracted radiation comprises positive first-order diffraction and negative first-order diffraction.

28. (Original) The method of claim 21, further comprising calculating a derived signal from the output signal.

29. (Original) The method of claim 28, wherein the derived signal contains information related to intensity, phase, or polarization angle.

30. (Original) The method of claim 28, wherein the derived signal contains information related to differential intensity, differential phase, or differential polarization angle.

31. (Original) The method of claim 28, further comprising providing a neutral polarization angle or quasi-neutral polarization angle; and wherein said determining a misalignment includes determining a misalignment by comparing the derived signal with the reference signal near the neutral polarization angle or the quasi-neutral polarization angle.

32. (Currently amended) The method of claim 31, wherein the derived signal is compared with the reference signal for polarization angles <u>of said incident radiation</u> within about five degrees of ~~the~~<u>a</u> neutral polarization angle or ~~the~~<u>a</u> quasi-neutral polarization angle.

33. (Original) An apparatus for detecting misalignment of overlying or interlaced periodic structures, comprising:

a source providing polarized incident radiation beam to illuminate the overlying or interlaced periodic structures;

at least one analyzer collecting diffracted radiation from the structures;

at least one detector detecting diffracted radiation collected by the analyzer to provide output signals; and

a signal processor determining any misalignment between the structures from the output signals.

34. (Currently amended) The apparatus of claim 33, wherein the source provides said incident radiation beam ~~having~~at an oblique angle of incidence to illuminate the overlying or interlaced periodic structures, and the detector detects zero-order diffraction.

35. (Original) The apparatus of claim 33, wherein the source provides a normal incident radiation beam to illuminate the overlying or interlaced periodic structures, and the detector detects zero-order diffraction.

36. (Original) The apparatus of claim 33, wherein the source includes a polarizer and a device causing relative rotational motion between the polarizer and the analyzer.

37. (Original) The apparatus of claim 33, wherein said at least one analyzer comprises a first analyzer collecting positive first-order diffracted radiation and a second analyzer collecting negative first-order diffracted radiation; and said at least one detector comprises a first detector detecting positive first-order diffracted radiation, and a second detector detecting negative first-order diffracted radiation.

38. (Original) The apparatus of claim 37, wherein the signal processor calculates a derived signal from the output signals.

39. (Original) The apparatus of claim 38, wherein the derived signal contains information related to a differential intensity, a differential phase, or a differential polarization angle.

40. (Currently amended) The apparatus of claim 38, wherein the source includes a polarizer, said apparatus further comprising ~~and~~ a device causing relative rotational motion between the polarizer and the analyzers.

41. (Original) The apparatus of claim 40, wherein the derived signal contains information related to a differential polarization angle or a phase difference derived from ellipsometric parameters.

42-43. (Cancelled)

44. (Original) An apparatus for making overlying or interlaced periodic structures and detecting misalignment between the overlying or interlaced periodic structures, comprising:

a deposition instrument to provide the overlying or interlaced periodic structures;

a source providing polarized incident radiation beam to illuminate the overlying or interlaced periodic structures;

at least one analyzer collecting diffracted radiation from the structures;

at least one detector detecting diffracted radiation collected by the analyzer to provide output signals; and

a signal processor determining any misalignment between the structures from the output signals and providing the misalignment to the deposition instrument.

45. (Currently amended) The apparatus of claim 44, wherein the source provides ~~an~~the incident radiation beam ~~having~~ at an oblique angle of incidence to illuminate the overlying or interlaced periodic structures, and the detector detects zero-order diffraction.

46. (Original) The apparatus of claim 44, wherein the source provides a normal incident radiation beam to illuminate the overlying or interlaced periodic structures, and the detector detects zero-order diffraction.

47. (Original) The apparatus of claim 44, wherein the source includes a polarizer and a device causing relative rotational motion between the polarizer and the analyzer.

48. (Original) The apparatus of claim 44, wherein said at least one analyzer comprises a first analyzer collecting positive first-order diffracted radiation and a second analyzer collecting negative first-order diffracted radiation; and said at least one detector comprises a first detector detecting positive first-order diffracted radiation, and a second detector detecting negative first-order diffracted radiation.

49. (Original) The apparatus of claim 48, wherein the signal processor calculates a derived signal from the output signals.

50. (Original) The apparatus of claim 49, wherein the derived signal contains information related to a differential intensity, a differential phase, or a differential polarization angle.

51. (Currently amended) The apparatus of claim 49, wherein the source includes a polarizer, said apparatus further comprising ~~and~~ a device causing relative rotational motion between the polarizer and the analyzers.

52. (Original) The apparatus of claim 51, wherein the derived signal contains information related to a differential polarization angle or a phase difference derived from ellipsometric parameters.

53-54. (Cancelled)

55. (Previously presented) A method for controlling layers alignment in a multi-layer sample, the method comprising the steps of:

(i) providing a measurement site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures of certain known periodicity;

(ii) illuminating said site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures; and

(iii) analyzing said parameter to determine an existing lateral shift between the layers.

56. (Previously presented) The method of claim 55, said pattern structures characterized by substantially the same periodicity.

57. (Previously presented) The method of claim 56, further comprising the steps of providing at least one additional site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures; illuminating said additional site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures and analyzing the parameters obtained in said sites to determine an existing lateral shift between the layers.

58. (Previously presented) The method of claim 57 wherein at least one of additional sites comprises pattern structures at essentially right angle to the pattern structures of the measurement site.

59. (Previously presented) The method of claim 55, further comprising the step of providing additional sites including regions containing pattern structures in one of the layers.

60. (Previously presented) The method of claim 55 wherein said detecting the parameter of radiation diffracted from the patterned structures indicative of a lateral shift

between the patterned structures comprises measuring said parameter as a function of wavelength.

61. (Previously presented) The method of claim 55 wherein said detecting the parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures comprises measuring radiation from the patterned structures at different angles.

62. (Previously presented) The method of claim 61, wherein said measuring measures radiation diffracted from the patterned structures at different angles.

63. (Previously presented) The method of claim 61, wherein said illuminating directs radiation to the site in a direction substantially normal to the regions.

64. (Previously presented) The method of claim 55 wherein said detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures comprises measuring said parameter as a function of a variable related to change of polarization amplitude and/or phase of the diffracted light.

65. (Previously presented) The method of claim 55 wherein the step of illuminating said site with electromagnetic radiation comprises illuminating with polarized light with different states of polarization.

66. (Previously presented) The method of claim 55 wherein said patterned structures are two-dimensional.

67. (Previously presented) The method of claim 66, the step of illuminating said site with electromagnetic radiation comprising illuminating with polarized light with different states of polarization.

68. (Previously presented) The method of claim 55, wherein said multi-layer sample comprises a semiconductors wafer.

69. (Previously presented) The method of claim 55, further comprising the steps of providing at least one additional reference site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures; illuminating said additional reference site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures and analyzing the parameters obtained in said sites to determine an existing lateral shift between the layers of said multi-layer sample.

70. (Previously presented) The method of claim 69, wherein said at least one additional reference site is on a second sample different from the multi-layer sample, and the steps of illuminating said additional reference site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures are performed on said second sample.

71. (Previously presented) The method of claim 55, wherein the analyzing analyzes the parameter obtained in said site in association with a database to determine an existing lateral shift between the layers of said multi-layer sample.

72. (Previously presented) The method of claim 71, further comprising providing information related to one or more of thickness, refractive index, extinction coefficient and critical dimension and constructing said database from such information.

73. (Previously presented) The method of claim 55, wherein said illuminating directs radiation to the site in a direction substantially normal to the regions.

74. (Previously presented) An apparatus for controlling alignment of layers in a multi-layer sample, comprising:

a measurement site including two regions located one above the other in two different layers of the sample, respectively, said regions containing patterned structures of certain known periodicity;

optics illuminating said site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures; and

a processor analyzing said parameter to determine an existing lateral shift between the layers.

75. (Previously presented) The apparatus of claim 74, said pattern structures characterized by substantially the same periodicity.

76. (Previously presented) The apparatus of claim 75, further comprising at least one additional site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures; said optics illuminating said additional site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures and processor analyzing the parameters obtained in said sites to determine an existing lateral shift between the layers.

77. (Previously presented) The apparatus of claim 74, wherein said optics measures said parameter as a function of wavelength.

78. (Previously presented) The apparatus of claim 74 wherein said optics measures said parameter as a function of a variable related to change of polarization amplitude and/or phase of the diffracted light.

79. (Previously presented) The apparatus of claim 74 wherein at least one of additional sites comprises pattern structures at essentially right angle to the pattern structures of the measurement site.

80. (Previously presented) The apparatus of claim 74 wherein the optics illuminates the site with polarized light with different states of polarization.

81. (Previously presented) The apparatus of claim 74 wherein said patterned structures are two-dimensional.

82. (Previously presented) The apparatus of claim 74 wherein said multi-layer sample comprises a semiconductors wafer.

83. (Previously presented) The apparatus of claim 74 wherein said two regions of the measurement site are connected to a common substrate.

84. (Previously presented) A method for controlling layers alignment in a multi-layer sample, the method comprising:

(i) providing a measurement site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures of certain known periodicity;

(ii) illuminating said site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures; and

(iii) analyzing said parameter to determine an existing lateral shift between the layers.

85. (Previously presented) A method for measuring layers alignment in a multi-layer sample, the method comprising the steps of:

(i) providing a measurement site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures of certain known periodicity;

(ii) illuminating said site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures; and

(iii) analyzing said parameter to determine an existing lateral shift between the layers.

86. (Previously presented) An apparatus for measuring alignment of layers in a multi-layer sample, comprising:

a measurement site including two regions located one above the other in two different layers of the sample, respectively, said regions containing patterned structures of certain known periodicity;

optics illuminating said site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures; and

a processor analyzing said parameter to determine an existing lateral shift between the layers.

87. (Previously presented) A method for measuring layers alignment in a multi-layer sample, the method comprising:

(i) providing a measurement site including two regions located one above the other in two different layers, respectively, said regions containing patterned structures of certain known periodicity;

(ii) illuminating said site with electromagnetic radiation and detecting a parameter of radiation diffracted from the patterned structures indicative of a lateral shift between the patterned structures; and

(iii) analyzing said parameter to determine an existing lateral shift between the layers.

88-118. (Cancelled)